

## Studies in the genus *Acacia* (Leguminosae: Mimosoideae)—10. *Acacia* species of the Wongan Hills, Western Australia

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### Abstract

Maslin, B. R. Studies in the genus *Acacia* (Leguminosae: Mimosoideae)—10. *Acacia* species of the Wongan Hills, Western Australia. Nuytsia 4(1): 29-46 (1982). Two new *Acacia* species endemic to the Wongan Hills, *A. botrydion* sp. nov. (section Phyllodineae) and *A. pharangites* sp. nov. (section Plurinerves) are described and illustrated. An emended description of *A. semicircularis* Maiden et Blakely is provided as this species and *A. botrydion* were formerly confounded. Notes are provided on a morphological variant of *A. acuarria* W. V. Fitzg. (section Phyllodineae) and also on a taxon allied to *A. obovata* Benth. (section Phyllodineae). Both these taxa are confined to the Hills. A checklist to the 28 *Acacia* species recorded for the Wongan Hills is provided. Analysis of the distributions of Wongan Hills *Acacias* showed that all Western Australian extra-tropical sections of the genus were represented there. Section Phyllodineae comprised 14 species, section Plurinerves seven species, section Juliflorae five species, section Alatae two species and section Pulchellae one species. A majority of the Wongan Hills *Acacia* species were confined to, and widespread within, the South-West Botanical Province. The south-western geographical affinities were supported from an examination of the taxonomically closest relatives of Wongan Hills *Acacias* where these affinities could be determined. Most Wongan Hills species appeared to be of recent origin, very few relict taxa being present. Endemism in the area proved to be relatively low. The Wongan Hills emerged as an important conservation site in the central wheatbelt.

### Taxonomy of some Wongan Hills *Acacia* species

The following notes and descriptions apply to those Wongan Hills *Acacia* species which are currently recognized as being in need of taxonomic clarification. Two new species, *A. botrydion* and *A. pharangites*, are described and illustrated, an emended description of *A. semicircularis* is given, and notes on two variants, *A. acuarria*-variant and *A. aff. obovata*, are provided. The taxa are numbered and arranged alphabetically and a list of all collections seen is given at the end of the paper.

#### 1. *Acacia acuarria* W. V. Fitzg.—variant.

This taxon is obviously related to *A. acuarria* (which also occurs in the Wongan Hills) but differs in its smaller legumes and its sparsely puberulous phyllodes which are slightly broader and which have recurved apices. In the absence of a detailed taxonomic investigation, formal rank is not here given to this variant. However, present indications are that at best it will be afforded infraspecific rank.

*Distribution and habitat.* Known only from the Wongan Hills near Mount Rupert on a lateritic plateau in open scrub dominated by mallee eucalypts.

*Flowering and fruiting period.* Judging from the very few specimens seen, flowering occurs around August-September and legumes mature in December-January.

*Specimens seen.* WESTERN AUSTRALIA: West side of Mount Rupert homestead, Wongan Hills, 30°49'S, 116°38'E, *K. F. Kenneally* 5875 (PERTH); South side of old Mount Rupert homestead, 6 km north of the Wongan Hills-Piawaning Road, *K. F. Kenneally* 6896 (CANB, PERTH).

## 2. *Acacia botrydion* Maslin, sp. nov. (Figures 1, 3A and 3B)

*Acacia semicircularis* Maiden et Blakely, J.Roy.Soc.W.Austral. 13:11 (1928), pro parte, not as to lectotype, as to Wongan Hills, 7 Oct. 1903, *A. Morrison* s.n. (NSW—lectoparatype) and pl.8, f.6.

*Frutex* rigidus, diffusus, intricatus, 0.5-1.3 altus. *Cortex* cineraceus. *Rami* et *ramuli* spinescentes, hispiduli; *ramuli* abbreviati, divaricati. *Phyllodia* asymmetricice elliptica a late-elliptica, 9-15 mm longa, 4-12 mm lata, aliquantum undulata, hispidula, 1-nervata. *Inflorescentia* racemosus vel interdum ad apices ramulorum paniculata ob phyllodia reducta; *pedunculi* c. 10 mm longi, didymi; *capitula* globulosa, c. 40 floribus. *Florae* 5-merae. *Sepala* lineari-spathulata. *Petala* glabra. *Legumina* circinata, submoniliformia, ad 4 cm longa ubi extensa, c. 4 mm lata. *Semina* (aliquot visa) in legumine longitudinalia, 3.5-4.5 mm longa, 2.5-3 mm lata, nigra.

*Typus:* About 12.5 km NW of Wongan Hills townsite towards Piawaning, Western Australia. "Harsh shrub to 1.3 m tall; branches smooth, light grey; branchlets spinescent; heads golden yellow; inflorescences not prolific, terminal on branchlets, axes red; phyllodes dull green, margins and tips orange to red. Laterite." 9 Sept. 1975, *B. R. Maslin* 3805 (holo: PERTH; iso: BRI, CANB, G, K, MEL, NSW, NY, PERTH).

Harsh, craggy, diffuse, intricately branched *shrubs* 0.5-1.3 m tall, domed and spreading to c. 3 m diam. in exposed areas, main stems sparingly branched near base. *Bark* light grey, smooth. *Branches* slightly flexuose, terete, obscurely nerved, hispidulous (hairs minutely tubercle-based), the apices together with the short divaricate branchlets are  $\pm$  spinescent and frequently devoid of phyllodes. *Stipules* triangular, 0.5-1 mm long, dark brown. *Phyllodes* asymmetrically elliptic to widely so, 9-15 mm long, 4-12 mm wide, length to width ratio 1-2, somewhat undulate, patent to slightly ascending, hispidulous, dark green to subglaucous, margins yellowish to orange-red; apex acutely mucronulate (mucro hooked or sometimes straight); *midrib* and *marginal nerves* evident, lateral nerves very obscure; *pulvinus* very reduced; *gland* not prominent, often apparently absent, when present situated on adaxial margin of phyllode 3-5 mm above the pulvinus. *Inflorescences* dense, showy, 1-2 per node, racemose or sometimes appearing paniculate towards the ends of the branchlets due to phyllode reduction; *raceme axis* 5-20 mm long, red-brown, sparsely hispidulous, supporting up to 5 pairs of pedunculate flower-heads; *basal peduncular bracts* solitary, triangular, c. 0.5 mm long; *peduncles* twinned, c. 10 mm long, red-brown, sparsely hispidulous. *Flower-heads* globular, light golden, c. 40-flowered; *bracteoles* linear-spathulate, c. 1.5 mm long, glabrous, claw pale, lamina brown. *Flowers* 5-merous, 2.5 mm long, glabrous; *calyx* 2/3 length of corolla, divided to base into narrow linear-spathulate sepals; *petals* nerveless and glabrous. *Legumes* circinate, submoniliform, to 4 cm long (expanded length), c. 4 mm wide, slightly resinous, red-brown, glabrous, very finely longitudinally wrinkled when dry, margins barely thickened. *Seeds* (few seen) longitudinal in legume, irregularly ellipsoid, turgid but sometimes slightly compressed, 3.5-4.5 mm long, 2.5-3 mm wide, dull, black; *pleurogram* very obscure, 'u'-shaped, open towards the hilum; *areole* minute, c. 0.5 x 0.6 mm; *funicle* filiform, minute, abruptly expanded into quite a large fleshy yellowish *aril* situated on top of the seed and folded once near the hilar end.

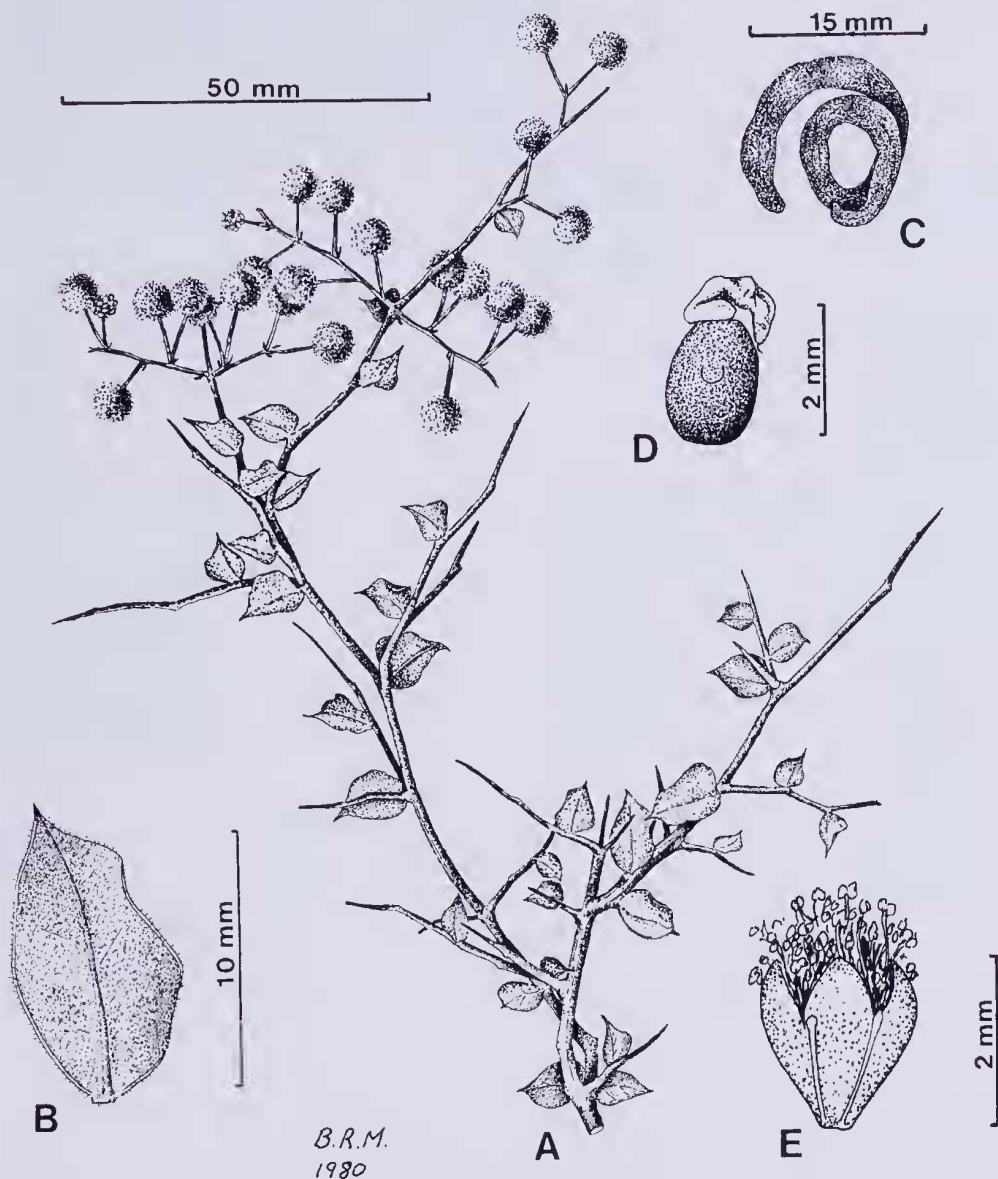


Figure 1. *Acacia botrydion*. A—Portion of branch showing the short, divaricate, spinescent branchlets and the clustering of inflorescences towards the end of the branch. B—Undulate phyllode. C—Legume. D—Seed. E—Flower showing linear-spathulate sepals.

A, B and E from B. R. Maslin 3382; C and D from B. R. Maslin 4429.

*Distribution and habitat.* Known only from the Wongan Hills where it is relatively common on lateritic hills and often associated with species such as *Eucalyptus ebbaensis*, *Melaleuca undulata* and *Phebalium brachycalyx*.

*Flowering and fruiting period.* Flowers from July to September. Legumes with mature seeds have been collected in December and January.

*Other specimens seen.* WESTERN AUSTRALIA: The Wongan Hills, top of Fowlers Gully on laterite cap, 21 July 1974, *K. F. Kenneally* s.n. (PERTH); 9 km NE of the township Wongan Hills on the Piawaning Road, 1 Sept. 1980, *K. F. Kenneally* s.n. (PERTH); 12.5 km from Wongan Hills township towards Piawaning, *B. R. Maslin* 3382 (AD, B, PERTH); The Wongan Hills, *B. R. Maslin* 4206 and 4429 (both PERTH); Northern end of the Wongan Hills, Mt. Rupert Station, *B. R. Maslin* 4547 (AD, PERTH); 7 mi (11.3 km) NW of Wongan Hills on the road to Piawaning, *M. D. Tindale* 2794 (NSW, PERTH).

*Acacia botrydion* is placed in section Phyllodineae and appears to be most closely allied to *A. semicircularis* (see below) with which it is sympatric and with which it has frequently been confused. Indeed, Maiden and Blakely's (1928) description of *A. semicircularis* was based on elements of both taxa necessitating lectotypification and an emended description in the present work (see p. 34 below). Besides being sympatric in the Wongan Hills, *A. botrydion* and *A. semicircularis* possess globular flower-heads and 1-nerved, undulate phyllodes which are very similar in shape and size. It is these features which seem to have led to the past confusion between the two. *Acacia botrydion*, however, is readily distinguished from *A. semicircularis* in the following ways. It is a harsher, more craggy and intricately branched shrub which forms bushes to 1.3 m tall. It has light grey bark and numerous short, divaricate, coarsely spinescent lateral branches which are frequently devoid of phyllodes. *Acacia semicircularis* on the other hand is a more wiry, sprawling, diffuse, open shrub often with long prostrate branches which are sparsely divided and which lack the short, coarsely spinescent branchlets of *A. botrydion*, its bark is reddish brown. Additionally *A. botrydion* has terminal clusters of racemes or panicles which form brilliant bright golden floral aggregates at flowering which occurs between July and September. *Acacia semicircularis* on the other hand has inflorescences which are less conspicuous and more scattered along the branches. Its principal flowering period is from September to January, however, a few flowers can usually be found throughout most of the year. *Acacia botrydion* has distinctly circinate legumes while those of *A. semicircularis*, besides being broader and not moniliform, are only gently curved. The phyllodes and branch apices in *A. botrydion* are always minutely hispidulous while in *A. semicircularis* they may be either glabrous or minutely hispidulous.

The specific epithet alludes to the inflorescences which are bunched at the ends of the branches.

### 3. *Acacia* aff. *obovata* Benth.

Glabrous *sub-shrubs* to 0.4 (0.7) m tall. *Phyllodes* elliptic-obovate, 1.5-3 cm long, 0.7-2 cm wide, bright green, apiculate, midrib obvious, frequently a minor second longitudinal nerve is present; *gland* small and insignificant. *Inflorescences* simple and axillary. *Flower-heads* white, c. 3-flowered. *Flowers* 4-merous; ovary one per flower, stipitate. *Legumes* narrow-oblong, 2-3 cm long, c. 5 mm wide, rather woody, flat, margins thickened.

*Distribution and habitat.* Known only from a single locality in the Wongan Hills where it grows in crevices of laterite conglomerate on a hill south-east of Mount Matilda. The vegetation at this locality is dense and dominated by *Casuarina campestris*, *Dryandra comosa*, *D. hewardiana*, *D. pulchella*, *Eucalyptus ebbanoensis* and *Isopogon divergens*.

*Flowering and fruiting period.* Judging from the specimens at hand the main flowering period is from about March to May. Legumes with near-mature seeds have been collected in late October.



*Specimens seen.* WESTERN AUSTRALIA: (All from the same population and all housed at PERTH.) *K. F. Kenneally* 5891, 7194 and 7496; *B. R. Maslin* 4550, 4550A and 4804.

The affinities of this taxon are clearly with *A. myrtifolia* and its allies, e.g. *A. celastrifolia*, *A. obovata*, *A. nervosa*, and a number of undescribed taxa from Western Australia. A treatment of this group will be the subject of a forthcoming paper and in this work the taxonomic status of this variant will be further considered. Present indications are that it may well constitute a distinct species.

#### 4. *Acacia pharangites* Maslin, sp. nov. (Figures 2, 3C and 3D)

*Frutex* ad 3(4) alta, aliquantum gracilis. *Rami* glabri. *Stipulae* deciduae. *Phyllodia* linearia-teretia, 1.5-4 cm longa, c. 1 mm lata, ascendentia, aliquantum rigida,  $\pm$  glaucescentia, glabra, 7-nervata, aliquantum pungentia. *Inflorescentia* racemus brevissimus; *pedunculi* c. 10 mm longi; *bractee basales pedunculi*, 1.5-2.5 mm longae; *capitula* obloidea, 7-10 mm longa, 5-6 mm lata, c. 25 floribus; *bracteolis* in capitula juveni conspicuis. *Florae* 5-merae. *Calyx* irregulariter lobatus. *Petala* glabra. *Legumina* anguste-oblonga, ad 6.5 cm longa, c. 4 mm lata, leviter undulata, glaucescentia, glabra. *Semina* in legumine longitudinalia, 3-3.5 x c. 2.5 x c. 2 mm, nigra, nitentia; *arillus* clavatus.

*Typus:* In the Wongan Hills, 18.5 km NW of Wongan Hills townsite towards Piawaning, 30° 50'S, 116° 39'E, Western Australia. "A somewhat spindly, open shrub to 4 m tall; phyllodes smooth, terete, ascending, subglaucescent; heads golden; bark grey, slightly roughened. In red-brown clay in a gully". 28 Aug. 1976, *B. R. Maslin* 4205 (holo: PERTH; iso: CANB, K, MEL, NY).

Somewhat spindly, open, erect *shrubs* to 3(4) m tall, with main stems sparingly branched near base and phyllodes concentrated towards ends of branches. *Bark* grey, slightly roughened. *Branches* marked with raised scars of fallen phyllodes, terete, finely nerved, glabrous. *New shoots* arising at distal end of a very reduced raceme axis and subtended by a few scarious light-brown striate glabrous but marginally white-fimbriate early deciduous bracts. *Stipules* imbricate in vegetative bud, very early deciduous, connate, light brown, striate, glabrous but apically fimbriate, margins slightly revolute, apex cleft. *Phyllodes* linear-terete, slightly narrowed towards the base, 1.5-4 cm long, c. 1 mm wide, straight to slightly curved, ascending, rather rigid, smooth and turgid when fresh but finely wrinkled upon drying,  $\pm$  glaucescent, glabrous; *nerves* seven (three abaxial with only the central one extending wholly from the apex to the pulvinus, two lateral and two adaxial), neither prominent nor raised when fresh, yellowish upon drying; *apex* mucronulate, mucro yellowish or brown and somewhat pungent; *pulvinus* yellowish when fresh, brown and finely transversely wrinkled when dry; *gland* situated on adaxial surface (between the two adaxial nerves) above the middle of the phyllode, not prominent. *Inflorescences* extremely reduced axillary racemes of 1(2) pedunculate flower-heads, the axis c. 0.5 mm long and terminated by a young vegetative shoot; *basal peduncular bract* relatively large (1.5-2.5 mm long), deciduous, scarious, brown, striate, auriculate at base, cleft at apex; *peduncles* c. 10 mm long, glabrous. *Flower-heads* obloid, 7-10 mm long, 5-6 mm wide, golden, c. 25-flowered; *bracteoles* conspicuously overtopping flowers in inflorescence bud, the claw less than 0.5 mm long, the lamina ovate 1.5-2 mm long c. 1 mm wide concave scarious finely striate brown white-fimbriate and sparsely puberulous abaxially near the base. *Flowers* 5-merous; *calyx* irregularly lobed, (1)2 lobes triangular and very reduced, the remaining lobes longer oblong dissected for 1/2-3/4 their length and sparsely ciliolate

at the apex; *petals* glabrous, obscurely 1-nerved. *Legumes* pendulous, narrowly oblong, to 6.5 cm long, c. 4 mm wide, slightly undulate, dark brown, glaucescent, glabrous, abruptly narrowed at both ends, prominently raised over the seeds with the umbo rounded and alternately more pronounced on one side of the legume than on the other; *margins* very slightly thickened, slightly but variably constricted between seeds. *Seeds* longitudinal in legume, irregularly ellipsoid but truncate along edge adjacent to aril, turgid, 3-3.5 mm long, c. 2.5 mm wide, c. 2 mm thick, black, shiny; *pleurogram* obscure, with a narrow opening towards the hilum; *areole* minute, c. 0.5 x 0.3 mm; *funicle* minute, abruptly expanded into a clavate yellowish  $\pm$  straight aril which is c. 3 mm long and which extends 1/3-1/2 down one side of the seed.

*Distribution and habitat.* Known only from the Wongan Hills where it grows along two or three sheltered gullies in rocky (greenstone) red-brown clay flanking seasonally dry creeks and also in grey sand of the creek beds themselves. The species is not common on the high ridges associated with these watercourses. Normally *A. pharangites* is of scattered occurrence and only rarely does it form dense stands. It occurs in dense scrub 3-4 m tall, dominated by *Calothamnus asper*, *Casuarina acutivalvis* and *Melaleuca radula* with sparse ground cover.

*Flowering and fruiting period.* Flowers in August; legumes with mature seed have been collected from mid-December to mid-January.

*Other specimens seen.* WESTERN AUSTRALIA: 18.5 km NW of Wongan Hills towards Piawaning, R. Convey 7847 and B. R. Maslin (CANB, K, MEL, NSW, PERTH, UC, US); Base of T.V. Translator Tower, Wongan Hills, 30° 50'S, 116° 38'E, K. F. Kenneally 7161 (PERTH); The Wongan Hills, B. L. Rye 8001 (AD, BM, BRI, G, PERTH); The Wongan Hills, B. R. Maslin 4427 (K, PERTH).

*Acacia pharangites* is difficult to place in the existing classifications of the genus. Its obloid flower-heads suggest inclusion in section Juliflorae, however, it is apparently not closely related to any other member of this group. Its general phyllode and legume morphology is similar to that of the south coastal species *A. tetanophylla* (section Plurinerves) but the two species are not particularly closely related. *Acacia pharangites* differs in its taller habit, reduced racemose inflorescences, obloid flower-heads, larger bracteoles and irregularly divided calyx. Additionally, the arrangement of the phyllode nervature in the two species is different. Although both species have 7-nerved phyllodes the two adaxial nerves in *A. tetanophylla* unite immediately above the gland. This does not occur in *A. pharangites* (compare Figure 2 here with Figure 6 in Maslin, 1977). Upon drying the phyllodes of *A. pharangites* are less sulcate than those of *A. tetanophylla*. Its lack of no close relatives indicates that *A. pharangites* should be considered a relict species.

Only about 400 individuals of *A. pharangites* are known to exist (Barbara Rye, pers. comm.). Considering also that the species has a very restricted range and appears to be very habitat-specific the existing populations must be afforded suitable protection in order to prevent the possible extinction of this unusual taxon.

The specific epithet alludes to the species gully habitat.

5. *Acacia semicircularis* Maiden et Blakely, J. Roy. Soc. W. Austral. 13:11 pl. 8 (1928). Lectotype: Wongan Hills, 3 Oct. 1903, A. Morrison s.n. (NSW; iso: K), lecto. nov. (Lectoparatype: Wongan Hills, 7 Oct. 1903, A. Morrison s.n.—see *A. botrydion* sp. nov. above.)

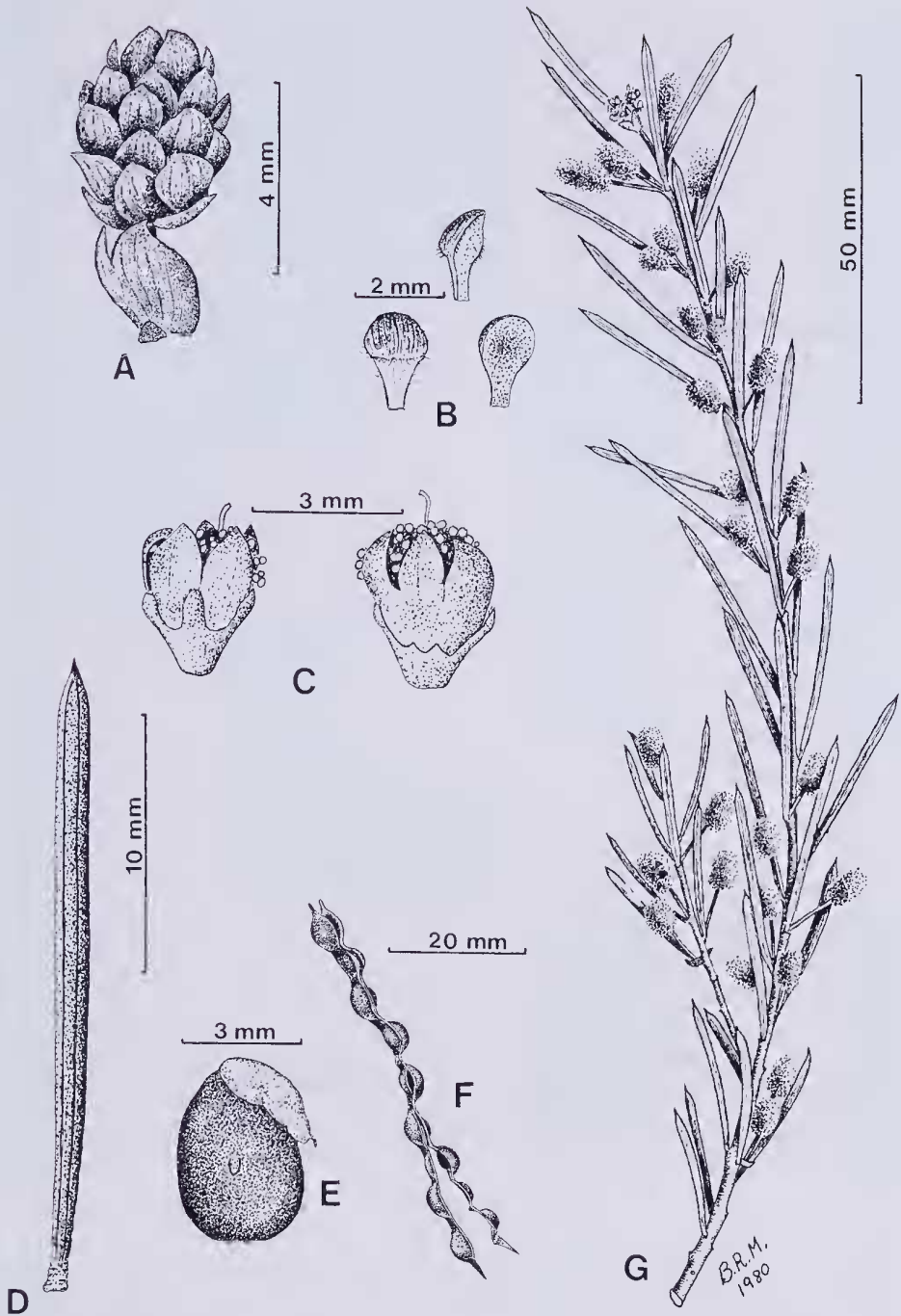


Figure 2. *Acacia pharangites*. A—Inflorescence bud showing the conspicuous bracteoles overtopping the flowers and the large, cleft basal bract. B—Bracteoles. C—Flowers (back and front views) showing the irregular lobing of the calyx. D—Phyllode (reconstituted) showing the two adaxial nerves. E—Seed. F—Legumes. G—Portion of branch showing obloid flower-heads.

A, B, C, D and G from *B. R. Maslin* 4205 (the Type); E and F from *B. R. Maslin* 4427.





Figure 3. A and B: *A. botrydion* (A—habit; B—branch showing short, divaricate, spinescent branchlets). C and D: *A. pharangites*. All photographed *in situ* in the Wongan Hills.

Wiry, open, diffuse *shrubs* to c. 1 m tall, often with sprawling prostrate branches. *Branches*  $\pm$  straight, terete, finely nerved, reddish brown to light brown, slightly shiny, sometimes sparsely verruculose, glabrous or sparsely hispidulous, terminally coarsely pungent but lacking the short divaricate  $\pm$  spinescent branchlets of *A. botrydion*. *Phyllodes* asymmetrically oblong-elliptic, 10-20 mm long, 5-9 mm wide, length to width ratio 1.5-3, slightly to obviously undulate, ascending at c. 45° from the branch, glabrous to hispidulous, light olive green to subglaucous, margins



yellowish; *base* unequal; *apex* obtuse or acute, mucronulate, the mucro minute acute indurate often slightly laterally positioned and straight or slightly hooked; *midrib* evident (raised when dry), centrally situated or slightly excentric, frequently yellowish, lateral veins few and obscure; *gland* very obscure, 0.5-2 mm above the base. *Inflorescences* scattered, 1(2) per node, either arising within axil of immature phyllodes at the ends of the branchlets, or alternatively, arising within the axil of mature phyllodes then consisting of a minute raceme of 1(2) pedunculate flower-heads borne on an extremely minute raceme axis terminated by a vegetative shoot, at anthesis this axis grows out and further peduncles may arise and reach anthesis before maturation of their subtending phyllode, this structure then resembles a short raceme 1-2 cm long; *basal peduncular bract* solitary; *peduncles* 5-13 mm long, glabrous or sparsely hispidulous, a small deciduous triangular bract normally occurs near or above the middle of the peduncle. *Flower-heads* globular, bright golden, c. 25-flowered. *Flowers* c. 2 mm long; *calyx* divided to base into 5 (rarely 4 or 7 in a few flowers) linear-spathulate sepals which are sparsely puberulous at the apex; *petals* 5, glabrous, nerveless. *Legumes* gently curved (not circinate), raised over but not (or barely) constricted between seeds, to 6 cm long and 6 mm wide, not resinous, reddish-brown, glabrous, finely longitudinally wrinkled when dry, at base narrowed into a stipe c. 5 mm long, at apex abruptly contracted; *margins* barely thickened. *Seeds* (seen only from near-mature spirit material) longitudinal in legume, obloid-ellipsoid, c. 6 mm long and 3.5-4 mm wide, turgid; pleurogram obscure, continuous; *areole* circular, 0.5-1 mm diam.; *funicle* minute (c. 1 mm long) and filiform, abruptly expanded into a large white to yellowish fleshy *aril* situated on top of the seed and with a short fold near the hilar end.

*Distribution and habitat.* Known only from the region of Wongan Hills where it is seemingly confined to lateritic hills. It has been recorded from about 3 km north-west of the Wongan Hills township west to the Wongan Hills themselves.

*Flowering and fruiting period.* Flowers principally from September to January but a few flowers can usually be found throughout most of the year. Legumes containing near-mature seeds have been collected in late November and in January.

*Other specimens seen.* WESTERN AUSTRALIA: 18.5 km (11.5 mi) NW of Wongan Hills towards Piawaning, 30° 50'S, 116° 39'E, *R. Coveny* 7841 and *B. R. Maslin* (CANB, K, NSW, PERTH) and 7842 (K, NSW, PERTH); Gully adjacent to Fowlers Gully, Wongan Hills, 30° 49'S, 116° 38'E, *K. F. Kenneally* 2413 (K, MEL, NSW, PERTH); Wongan Hills, 2 km S Wongan Hills-Piawaning Road, *K. F. Kenneally* 7160 (PERTH); 2 mi (3.4 km) out of Wongan Hills towards Piawaning, *F. Lullfitz* L1653 (PERTH); 4.5 mi (7 km) NW of Wongan Hills township towards Elphin, *B. R. Maslin* 134 and 1635 (both PERTH); About 12.5 km NW of Wongan Hills township towards Piawaning, *B. R. Maslin* 3804 (CANB, PERTH); The Wongan Hills, *B. R. Maslin* 4428 (C.N.R.S.\*, PERTH); The Wongan Hills, south-east of Mount Matilda on Conway's property, *B. R. Maslin* 4806 (PERTH).

The original description of *A. semicircularis* was based on two un-numbered Morrison collections from the Wongan Hills, one in flower (here selected as the lectotype), the other in fruit (see *A. botrydion* above). The epithet 'semicircularis' is not altogether appropriate for the legumes of either species (see descriptions above) therefore a rather arbitrary choice of the flowering specimen as the lectotype was made. *Acacia semicircularis* is illustrated in Maiden and Blakely (1928) plate VIII, ff. 1-5. The fruiting specimen illustrated in this plate (f.6) is *A. botrydion*.

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### Phytogeography of *Acacia* in the Wongan Hills.

The Wongan Hills are situated in a region termed the transitional-rainfall zone of south-west Western Australia (Hopper, 1979). This zone lies between the dry arid zone and the more temperate areas bordering the south-west coast of Western Australia. Rainfall in the area is from 300-800 mm p.a. The landform is of low relief but of diverse topography characterized by laterite-capped divides separated by broad valleys, by plains of considerable edaphic complexity, by saltlakes and by emergent granite monadnocks. The transitional-rainfall zone is very rich in species and among the historical factors listed by Hopper as contributing to this richness are recurrent climatic stresses and erosional dynamism in the Quaternary associated with weathering of the laterites of the area.

The laterite-dominated Wongan Hills, with their expanse of relatively undisturbed vegetation, provide an excellent site for examining a specific habitat within the edaphically complex transitional-rainfall zone. *Acacia* is well-suited for such an analysis because it is well represented in species and their taxonomy is relatively well understood.

*Results and discussion.* With its 28 species (Table 1), *Acacia* is the largest plant genus in the Wongan Hills, although in terms of abundance it is eclipsed by genera such as *Eucalyptus*, *Casuarina* and *Melaleuca*. The five *Acacia* species recorded by Kenneally (1977) from the adjacent, non-lateritic Mortlock Creek area or which occur as roadside invaders within the Hills are not included in the present study. The Hills are located on the National Mapping 1:250 000 'Moora' sheet which covers c. 1.5 million ha and which has the highest concentration of *Acacia* species for the State and probably also for Australia (94 described species—Hnatiuk and Maslin, 1980b). With about 30 per cent of *Acacia* species on this sheet occurring in the Hills, the importance of this small area (c. 1 750 ha) is readily appreciated.

Except for the entirely tropical/desert sections *Acacia* and *Lycopodiifoliae* (which together comprise 13 species within Western Australia) all infrageneric groups of the genus occurring in this State are represented in the Hills. Half the species are contained in section *Phyllodineae* (14 species) while the closely related sections *Plurinerves* and *Juliflorae* have seven and five species respectively and sections *Alatae* and *Pulchellae* have only two and one species each (Table 1).

Nineteen species, or about 2/3 of the Wongan Hills *Acacia* species, are restricted to the South-West Botanical Province (Table 1). Those species extending beyond the Province are mostly confined to the western margins of the adjacent *Eremaean* and *South-West Interzone* regions. *Acacia acanthoclada* just reaches the *Desert* region while this species and *A. erinacea* are the only taxa extending into eastern Australia. No Wongan Hills species occur in the northern tropical/subtropical areas of Australia.

Sixteen Wongan Hills *Acacia* species are widespread within south-west Western Australia (ranges exceeding 500 km). Of the remaining species nine have more restricted south-western distributions (ranges to c. 500 km), while only three taxa, *A. botrydion*, *A. aff. obovata* and *A. pharangites*, are strictly endemic to the Hills. Apart from *A. dura* and *A. semicircularis* which grow in the general region of the Hills but not entirely confined within their boundary, those species with restricted ranges occur in the central and northern part of the wheatbelt from about Southern Cross to the Murchison River.

Table 1. Results of geographical analysis of *Acacia* sections occurring in the Wongan Hills.

Section (Pedley, 1978)	Number of spp. in the Wongan Hills	No. of WH spp. endemic to SWBP/WH	NBP	Distribution of WH outside SWBP					
				EBP					Extra-WA
				pr	dr	er	np	swi	
Pulchellae	1	1/0	—	—	—	—	—	—	—
Alatae	2	1/0	—	—	—	—	—	—	—
Phyllodineae	14	10/2	—	—	1	3	1	3	2
Plurinerves	6	5/1	—	—	—	1	—	2	—
Juliflorae	5	2/0	—	—	—	2	1	3	—
TOTALS	28	19/3	—	—	1	6	2	8	2

Abbreviations for botanical Provinces and Regions are adapted from Hopper and Maslin (1978): EBP—Eremaean Botanical Province (dr—Desert Region; er—Eremaean Region; np—Nullarbor Plain; pr—Pilbara Region; swi—South-West Interzone Region); NBP—Northern Botanical Province. SWBP—South-West Botanical Province. WA—Western Australia. WH—Wongan Hills.

The south-western geographical affinities of the Wongan Hills *Acacia* species are supported by examining the distributions of their taxonomically closest relatives. Of the 24 species for which close relatives can be determined, all but *A. shuttleworthii* have their closest relative within the South-West Botanical Province and 14 of these are entirely confined to the Province itself (Table 2). Ten of these close relatives are widespread throughout the Province and have ranges exceeding 500 km. Another 12 are generally less widespread and are restricted to the central or southern parts of the Province in areas south of about Moora. Only one close relative, *A. leptospermoides* subsp. *obovata*, is confined to the northern part of the Province, while only *A. gregorii*, the possible closest relative of *A. shuttleworthii*, occurs entirely in the Eremaean Province to the north.

As 24 Wongan Hills *Acacias* appear to have at least one close relative it suggests that the majority of the *Acacia* species in this region are of recent origin. Relict taxa (i.e. ones not possessing even a single close relative) are difficult to detect with certainty, although, *A. denticulosa* and *A. pharangites* seem to fall into this category. *Acacia dura*, *A. erinacea* and *A. restiacea* are also possible relicts but further work is required to assess the true taxonomic position of these species.

Hopper (1979) observed that within the transitional rainfall zone there existed a large number of recently evolved species and relatively few relict taxa. He also noted that within the wheatbelt area of the zone there existed few local endemic taxa relative to the two main heathland centres. To a large extent the Wongan Hills *Acacia* data presented here support these observations.

From the above discussion it is seen that the Wongan Hills offer a habitat not only for endemic taxa but also for species with relatively restricted ranges in the central and northern parts of the Western Australian wheatbelt. The wheatbelt is under considerable pressure from agricultural activity (Kitchener, 1976; Kenneally, 1977) and only a few relatively undisturbed stands of native vegetation remain. Most uncleared wheatbelt land is probably privately owned farmland (Kitchener et al.,



1980). Thus, areas such as the Wongan Hills are invaluable conservation sites for species such as these restricted *Acacia* species which, in the course of time, will most probably become even scarcer. Additionally, as noted above, two taxa endemic to the Wongan Hills, *A. aff. obovata* and *A. pharangites*, are exceedingly rare there. Both appear to have very narrow habitat preferences and are represented by very low numbers of individuals. In the former case by fewer than 50 plants and in the latter by no more than a few hundred. Undue site disturbance in either case may well lead to their extinction.

### Acknowledgements

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### Index to specimens examined for the taxonomic treatment in this work

This index is arranged alphabetically according to the name of the collector. Number in parentheses refer to the corresponding numbered taxon in the text. Unless otherwise stated, the specimens are housed at the Western Australian Herbarium (PERTH).

- Coveny, R. and Maslin, B. R. 7841 (5-CANB, K, NSW, PERTH), 7842 (5-K, NSW, PERTH), 7847 (4-CANB, K, MEL, NSW, PERTH, UC, US)—numbers are Coveny collecting numbers.
- Kenneally, K. F. 2413 (5-K, MEL, NSW, PERTH); 5875(1); 5891(3); 6896 (1-CANB, PERTH); 7160(5); 7161(4); 7194(3); 7496(3); s.n., 21 July 1974 (2); s.n., 1 Sept. 1980 (2).
- Lullfitz, F. L1653(5).
- Maslin, B. R. 134(5); 1635(5); 3804 (5-CANB, PERTH); 3805 (2-holo: PERTH; iso: BRI, CANB, G, K, MEL, NSW, NY, PERTH); 3382 (2-AD, B, PERTH); 4205 (4-holo: PERTH; iso: CANB, K, MEL, NY); 4206(2); 4427(4-K, PERTH); 4428(5-Montpellier, PERTH); 4429(2); 4547(2); 4550 and 4550A; 4806(5).
- Morrison, A. s.n., 3 Oct. 1903 (5-lecto: NSW; iso: K); s.n., 7 Oct. 1903 (2-lectoparatype of *A. semicircularis*: NSW).
- Rye, B. L. 80001 (4-AD, BM, BRI, G, PERTH).
- Tindale, M. D. 2794 (2-NSW, PERTH).

Table 2. List of Wongan Hills *Acacia* species giving their salient features, distributions and closest relative with its distribution.

Section (Pedley, 1978)	Taxon	Salient featuresA	DistributionB	Closest relative		Notes
				Taxon	DistributionB	
<i>Pulchellae</i> (Benth.) Taub. (Leaves bipinnate; flower-heads globular)	<i>A. pulchella</i> var. <i>glaberrima</i> Meisn.	Harsh, diffuse shrub 1 m tall with numerous axillary spines.	WA: SWBP. (Northampton- Ravensthorpe)	<i>A. pulchella</i> R.Br. var. <i>pulchella</i>	WA: SWBP (Moora-Albany; Jarrah forest)	Wongan Hills populations represent the 'inland' variant of var. <i>glaberrima</i> referred to in Maslin (1975:403).
<i>Alatae</i> (Benth.) Pedley (Phyllodes decurrent or absent; flower- heads globular)	<i>A. stenoptera</i> Benth.	Shrub c. 1 m tall, with winged stems produced into decurent, recurved, ± pungent phyllodes; flower- heads cream; legumes winged.	WA: SWBP (Geraldton- Ravensthorpe)	<i>A. tetragonocarpa</i> Meisn.	WA: SWBP. (Moora-Esperance; scattered, not common)	
	<i>A. restiacea</i> Benth.	Fastigate shrub with slender, leafless branches to 0.8 cm long; racemes enclosed by conspicuous brown bracts when young.	WA: SWBP. (Murchison River- Kellerberrin)	Unknown		Due to the lack of phyllodes the species is difficult to place in existing classifications.
<i>Phyllodineae</i> DC. (Phyllodes flat, with one ± central nerve on each face; flower- heads globular or slightly obovate)	<i>A. acanthoclada</i> F. Muell.	Harsh, diffuse shrub with short spinescent branchlets; phyllodes 3-7 mm long, asymmetrically cuneate with rounded apices.	WA: SWBP; EBP - swi, dr; S.A.; Vict. southern Australia)	<i>A. bidentata</i> Benth.	WA: SWBP (Murchison River- Ravensthorpe)	
	<i>A. acuaria</i> W.V. Fitzg.	Dense, much- branched shrub 1.5 m tall; phyllodes spreading, needle- like; legumes dark brown, moniliform.	WA: SWBP; EBP - er. (Murchison River-Southern Cross)	<i>A. benthamii</i> Meisn.	WA: SWBP. (Known only from the Perth region)	Together with the typical form, a variant of this species occurs in the Wongan Hills—see p. 29 above.

Table 2. List of Wongan Hills *Acacia* species giving their salient features, distributions and closest relative with its distribution—continued.

Section (Pedley 1978)	Taxon	Salient features A	Distribution B	Closest relative		Notes
				Taxon	Distribution B	
<i>Phyllodineae</i> DC. (Phyllodes flat, with one $\pm$ central nerve on each face; flower-heads globular or slightly obloid)	<i>A. bidentata</i> Benth.	Harsh, diffuse sub-shrub 0.2 m tall; phyllodes c. 3 mm long, with rounded and obliquely mucronulate apices.	WA: SWBP. (Murchison River-Ravensthorpe)	<i>A. orbifolia</i> Maiden et Blakely	WA: SWBP. (Moora-Southern Cross)	A widespread, variable species in need of taxonomic revision.
	<i>A. botrydion</i> Maslin	Craggy, intricate shrub to 1.3 m tall, with short coarsely spinescent branchlets; phyllodes undulate, 9-15 x 4-12 mm; inflorescence clustered in bunches; at ends of branches; legumes coiled.	WA: SWBP. (Restricted to the Wongan Hills)	<i>A. semicircularis</i> Maiden et Blakely	WA: SWBP. (Wongan Hills area)	A full description of these species is given on p. 30 above.
<i>A. cliftoniana</i> W.V. Fitzg.	<i>A. cliftoniana</i> W.V. Fitzg.	Harsh, diffuse shrub to 2 m tall; stipules spinose; phyllodes c. 10 x 4 mm, asymmetric, tip spinose; flower-heads very slightly obloid; legumes strongly curved.	WA: SWBP (Arrino-Wongan Hills)	<i>A. congesta</i> Benth.	WA: SWBP. (Geraldton-Mt. Barker)	
<i>A. erinacea</i> Benth.	<i>A. erinacea</i> Benth.	Intricate sub-shrub c. 0.5 m tall, with short spinescent branchlets; phyllodes 5-10 x 2-3 mm; legumes oblong, $\pm$ flat, not constricted between seeds.	WA: SWBP; EBIP-swi, er, np; S.A. (Murchison River-Dumpleyung, then east to S.A. near Eucla)	Unknown		The absence of recognisable close relatives suggests that this may be a relict species.



*Phyllodineae* DC.  
(Phyllode flat, with one ± central nerve on each face; flower-heads globular or slightly obloid).

<i>A. hemiteles</i> Benth. (syn. <i>A. graffiana</i> F. Muell.)	Shrub 2 m tall, phyllodes c. 7 cm x 7 mm, rigid, often gently curved, acute, midrib prominent; inflorescences racemose; pods papery, often coiled.	<i>A. prainii</i> Maiden et Blakely	WA: SWBP; EBP-dr; N.T.; S.A. (Perenjori east to Central Australia)
<i>A. ligustrina</i> Meisn.	Shrub or tree to 3 m tall, canopy dense; phyllodes 2-4 cm x c. 5 mm, spreading, greyish green, 1-2 glands raised along upper margin; aril orange, almost completely enclosing seed.	<i>A. merrallii</i> F. Muell.	WA: SWBP; EBP-swi, np; S.A. (Perenjori east to S.A.)
<i>A. microbotrya</i> Benth.	Bushy tree 2-3 m tall; phyllodes falcate, c. 10 x 1 cm; racemes prolific; legumes long, moniliform, dark brown; flowering in autumn.	<i>A. jennerae</i> Maiden	WA: SWBP; EBP-swi, er, dr; N.T.; N.S.W. (Merredin, east to Central Australia in arid/semi-arid areas)
<i>A. aff. obovata</i> Benth.	Sub-shrub c. 0.4 m tall; phyllodes elliptic-obovate, 1.5-3 x 0.7-2 cm; flowers white.	<i>A. obovata</i> Benth.	WA: SWBP. (Mt. Lesueur to Augusta)  This taxon is discussed on p. 32 above.
<i>A. orbifolia</i> Maiden et Blakely	Dense spreading shrub 1.5 m tall; branchlets white; phyllodes rounded, c. 1 cm diam., dark green; flower-heads creamy white.	<i>A. bidentata</i> Benth.	WA: SWBP. (Murchison River-Ravensthorpe)
<i>A. semicircularis</i> Maiden et Blakely	Sprawling shrub, branches often prostrate; phyllodes 1-2 cm x 5-9 mm, undulate; legumes curved.	<i>A. botrydion</i> Maslin	WA: SWBP. (Restricted to the Wongan Hills)  This species is discussed on p. 34 above.

Table 2. List of Wongan Hills *Acacia* species giving their salient features, distributions and closest relative with its distribution—continued.

Section (Pedley 1978)	Taxon	Salient features A	Distribution B	Closest relative		Notes
				Taxon	Distribution B	
<i>Phylloclineae</i> DC. (Phyllodes flat, with one $\pm$ central nerve on each face; flower-heads globular or slightly obloid)	<i>A. shuttleworthii</i> Meisn.	Compact, hairy shrub to c. 0.5 m tall; phyllodes c. 10 x 6 mm, very undulate, apices acute; flower-heads cream; flowering in summer.	WA: SWBP. (Mogumber-Cunderdin; Nyabing. Apparently a disjunct distribution)	Perhaps <i>A. gregorii</i> F. Muell.	WA: EBP-er. (Carnarvon-Onslow)	Further study required to establish the true affinities of this species.
	<i>A. ulicina</i> Meisn.	Harsh, intricate shrub c. 0.5 m tall; branches glaucescent, striate, with numerous short divaricate spinescent branchlets; phyllodes c. 5 x 1 mm.	WA: SWBP. (Murchison River-Kellerberrin)	<i>A. spinosissima</i> Benth.	WA: SWBP; EBP-swi. (York-Norseman area)	
<i>Plurinerves</i> (Benth.) Maiden et Betche (Phyllodes flat or terete, nerves numerous; flower-heads globular or rarely obloid)	<i>A. assimilis</i> S. Moore	Dense shrub to 3 m tall; phyllodes filiform, terete, more than 8-nerved, bright green, with white plumose tips.	WA: SWBP; EBP-swi. (Yalgoo-Bremer Bay and Norseman)	<i>A. triptycha</i> F. Muell. ex Benth.	WA: SWBP. (Busselton-Cape Arid)	
	<i>A. dura</i> Benth.	Obconic shrub 1 m tall, canopy dense; phyllodes ascending, c. 3-5 cm x 2 mm, broad-linear, slightly curved, prominently 2-nerved on each face.	WA: SWBP. (Restricted to the general region of Wongan Hills)	Unknown		The absence of readily detectable close relatives suggests that this may be a relict species.
	<i>A. fragilis</i> Maiden et Blakely	Dense shrub to 2 m tall; phyllodes filiform, terete, 8-nerved, dark green, with white plumose tips.	WA: SWBP; EBP-swi. (Geraldton-Esperance)	<i>A. uncinella</i> Benth. (Taxonomy in need of review)	WA: SWBP; EBP-swi, er. (Corrigin-Esperance; Sandstone area)	

<i>Plurinerves</i> (Benth.) Maiden et Betche (Phyllodes flat or terete, nerves numerous; flower-heads globose or rarely obloid)	<i>A. latipes</i> Benth.	Harsh, diffuse shrub c. 1 m tall; phyllodes rigid, patent, strongly 3-nerved, c. 1.5 cm long and tapered to sharp apices.	WA: SWBP. (Shark Bay-Esperance)	<i>A. cochlearis</i> (Labiell.) H. Wendl.	WA: SWBP: EBP-mp. (Coastal dunes)	
	<i>A. leptospermoides</i> Benth. subsp. <i>leptospermoides</i>	Obconic shrub 1 m tall; phyllodes c. 10 x 4 mm, narrowly obovate, glaucescent; legumes light brown, distinctly curved.	WA: SWBP. (Shark Bay-Cranbrook)	<i>A. leptospermoides</i> subsp. <i>obovata</i> Maslin	WA: SWBP. (Murchison River)	The broad, flat phyllode form referred to in Maslin (1978) occurs in the Wongan Hills.
	<i>A. pharangites</i> Maslin	Spindly, open shrub to 3(4) m tall; phyllodes linear-terete, to 4 cm long, glaucescent; flower-heads obloid.	WA: SWBP. (Restricted to gullies in the Wongan Hills)	Distantly related to <i>A. tetanophylla</i> Maslin	WA: SWBP. (Stirling Range-Ravensthorpe area)	Presumably a relict species (see p. 33 above).
<i>Juliflorae</i> (Benth.) Maiden et Betche (Phyllodes flat or terete, nerves numerous; flower-heads in cylindrical spikes)	<i>A. acuminata</i> Benth.	Tree to 4 m tall; phyllodes flat, marginally white-fimbriate on upper 1/3.	WA: SWBP; EBP-swi, er, np. (Shark Bay-Albany then Norseman)	<i>A. burkittii</i> F. Muell. ex Benth.	WA: SWBP; EBP-er, dr, np, S.A.; N.S.W. (Southern semi-arid areas of Australia)	
	<i>A. denticulosa</i> F. Muell.	Open shrub to 3.5 m tall; phyllodes c. 6-7 x 4-5 cm, coriaceous, asperulate, reticulate-veined; spikes dense.	WA: SWBP. (Wongan Hills-Nungarin, favours granite rocks)	Unknown		Perhaps a relict species.



Table 2. List of Wongan Hills *Acacia* species giving their salient features, distributions and closest relative with its distribution—continued.

Section (Pedley 1978)	Taxon	Salient featuresA	DistributionB	Closest relative		Notes
				Taxon	DistributionB	
<i>Juiflorae</i> (Benth.) Maiden et Betche (Phyllodes flat or terete, nerves numerous; flower-heads in cylindrical spikes)	<i>A. lasiocalyx</i> C. Andrews	Tree to 4 m tall; branchlets pruinose; phyllodes long (to 25 cm), broad-linear, lax, falcate, glabrous.	WA: SWBP; EBP-swi. (Perenjori-Cape Arid)	<i>A. signata</i> F. Muell.	WA: SWBP; EBP-er. (Murchison River-Esperance)	
	<i>A. multispicata</i> Benth.	Dense shrub 1-2 m tall; phyllodes linear-terete, 3-4 cm long, slightly curved, with a small hooked apical mucro; spikes sessile.	WA: SWBP. (Murchison River-Ravensithorpe)	<i>A. sessilispica</i> Maiden et Blakely	WA: SWBP. (Morawa-Newdegate)	
	<i>A. neurophylla</i> W.V. Fitzg.	Dense shrub to 2 m tall; phyllodes c. 8 x 0.5 cm, strongly veined with distant nerves, rather straight and rigid.	WA: SWBP; EBP—swi, er. (Murchison River area—Norseman)	<i>A. cochlocarpa</i> Meisn.	WA: SWBP. (Moora-Kellerberrin)	

A The features given here refer only to the Wongan Hills populations. No account is taken of variation encountered outside this region.  
 B Abbreviations for Western Australian botanical Provinces and Regions are adapted from Hopper and Maslin (1978): EBP=Eremaean Botanical Province (dr—Desert Region; er—Eremaean Region; np—Nullarbor Plain; swi—South-West Interzone Region). SWBP—South-West Botanical Province. Australian State abbreviations are given in capitals. Distribution maps for all species listed here are given in Hnatiuk and Maslin (1980a).